WHAT IS CLAIMED IS:

1. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

means for producing an ultrasonic image from said harmonic echo signals.

2. The ultrasonic diagnostic imaging system of Claim 1, wherein said means for transmitting and said means for receiving comprise an ultrasonic transducer probe.

3. The ultrasonic diagnostic imaging system of Claim 2, wherein said ultrasonic transducer probe comprises a plurality of transducer elements for transmitting ultrasonic energy at a fundamental frequency and for receiving ultrasonic echo signals at a harmonic of said fundamental frequency.

4. The ultrasonic diagnostic imaging system of Claim 3, wherein said transducer elements exhibit a response characteristic which encompasses both said fundamental frequency and said harmonic of said fundamental frequency.

5. The ultrasonic diagnostic imaging system of Claim 1, wherein said means for receiving ultrasonic echo signals at a harmonic of said fundamental frequency comprises a filter defining a passband

which includes said harmonic frequency to the exclusion of said fundamental frequency.

6. The ultrasonic diagnostic imaging system of Claim 5, wherein said filter comprises a programmable digital filter.

7. The ultrasonic diagnostic imaging system of Claim 1, wherein said means for producing an ultrasonic image includes a B mode processor.

8. The ultrasonic diagnostic imaging system of Claim 7, wherein said B mode processor includes an amplitude detector for detecting the envelope of said harmonic echo signals.

9. The ultrasonic diagnostic imaging system of Claim 1, wherein said structure comprises naturally occurring structure of the body.

10. The ultrasonic diagnostic imaging system of Claim 9, wherein said naturally occurring structure comprises tissue and cells of the body.

11. A method for producing an ultrasonic image from the harmonic response of the interior of the body comprising the steps of:

transmitting ultrasonic energy into the body at a fundamental frequency;

receiving ultrasonic echo signals at a harmonic of said fundamental frequency; and

processing said harmonic echo signals to produce ultrasonic image display signals; and

displaying said ultrasonic image display signals.

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12. The method of Claim 11, wherein the steps of transmitting and receiving comprise using an ultrasonic probe with a transducer array to transmit fundamental frequency ultrasonic energy and receive harmonic echo signals.

13. The method of Claim 12, wherein the step of using an ultrasonic probe comprises the step of transmitting fundamental frequency ultrasonic energy and receiving harmonic echo signals with the same transducer elements.

14. The method of Claim 11, wherein the step of receiving ultrasonic echo signals at a harmonic of said fundamental frequency comprises passing received ultrasonic echo signals through a filter which passes signals at said harmonic of said fundamental frequency to the exclusion of said fundamental frequency.

15. The method of Claim 11, wherein said processing step comprises B mode processing said harmonic echo signals.

16. The method of Claim 15, wherein said step of B mode processing includes the step of amplitude detecting said harmonic echo signals.

17. An ultrasonic diagnostic imaging system for producing an ultrasonic image of the harmonic response of structure inside a body with reduced artifacts, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency;

means for processing said harmonic ultrasonic echo signals to generate at least partially decorrelated replicas of said echo signals;

means for combining said decorrelated replicas to produce artifact-reduced harmonic echo signals; and

means for utilizing said artifact-reduced harmonic echo signals to produce an ultrasonic image.

18. The ultrasonic diagnostic imaging system of Claim 17, wherein said artifacts comprise dropout artifacts.

19. The ultrasonic diagnostic imaging system of Claim 18, wherein said artifacts further comprise speckle artifacts.

20. The ultrasonic diagnostic imaging system of Claim 17, wherein said means for processing comprises a bandpass filter for separating components of said harmonic ultrasonic echo signals into two passbands having differing center frequencies.

21. The ultrasonic diagnostic imaging system of Claim 20, wherein said means for processing further comprises a detector for detecting harmonic ultrasonic echo signals in each of said passbands.

22. The ultrasonic diagnostic imaging system of Claim 21, wherein said means for processing further comprises a log compression processor for log

compressing said detected harmonic ultrasonic echo signals.

23. The ultrasonic diagnostic imaging system of Claim 17, wherein said processing means comprises two parallel channels, each having an input coupled to receive harmonic ultrasonic echo signals and an output coupled to said combining means,

wherein each of said channels includes a bandpass filter having a filter characteristic different from that of the other channel.

24. The ultrasonic diagnostic imaging system of Claim 23, wherein said filter characteristic is the peak response frequency of the filter.

25. The ultrasonic diagnostic imaging system of Claim 23, wherein said filter characteristic is the center frequency of the filter.

26. The ultrasonic diagnostic imaging system of Claim 23, wherein each of said channels further includes a detector.

27. The ultrasonic diagnostic imaging system of Claim 26, wherein each of said channels further includes a log compression processor.

28. The ultrasonic diagnostic imaging system of Claim 17, wherein said processing means comprises means for separating said harmonic ultrasonic echo signals into two passbands of unequal dynamic range.

29. The ultrasonic diagnostic imaging system of Claim 28, wherein said two passbands comprise a low

frequency passband and a high frequency passband, and wherein the dynamic range of said low frequency passband is less than that of said high frequency passband.

30. The ultrasonic diagnostic imaging system of Claim 29, wherein said processing means further comprises means for mapping the dynamic range of each of said passbands differently.

31. A method for producing a harmonic ultrasonic image with reduced artifacts comprising the steps of:

transmitting ultrasonic energy at a fundamental frequency;

receiving ultrasonic echo signals at a harmonic of said fundamental frequency;

processing said harmonic echo signals to produce decorrelated replicas of said signals;

combining said decorrelated replicas to produce artifact reduced harmonic echo signals; and

utilizing said artifact reduced harmonic echo signals to produce an ultrasonic image.

32. The method of Claim 31, wherein the step of processing said harmonic echo signals comprises separating components of said harmonic echo signals into two different passbands.

33. The method of Claim 32, wherein the step of processing said harmonic echo signals comprises separating components of said harmonic echo signals into two different passbands of unequal dynamic range.

34. The method of Claim 33, wherein the step of processing said harmonic echo signals comprises separating components of said harmonic echo signals into a high frequency passband of a given dynamic range and a low frequency passband of a dynamic range which is less than that of said given dynamic range.

35. An ultrasonic diagnostic imaging system for producing a harmonic ultrasonic image of structure inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at said fundamental frequency and at a harmonic of said fundamental frequency; and

an image processor which processes said received fundamental frequency echo signals and harmonic frequency echo signals to produce an ultrasonic image formed of components of both said fundamental and said harmonic echo signals.

36. The ultrasonic diagnostic imaging system of Claim 35, wherein said receiving means includes means for producing separated fundamental and harmonic frequency echo signals.

37. The ultrasonic diagnostic imaging system of Claim 36, wherein said receiving means includes a filter for producing fundamental frequency echo signals to the at least partial exclusion of harmonic frequency echo signals, and for producing harmonic frequency echo signals to the at least partial exclusion of fundamental frequency echo signals.

38. The ultrasonic diagnostic imaging system of Claim 35, wherein said image processor comprises means for utilizing predominately harmonic echo signals in the near field of said image, and predominately fundamental frequency echo signals in the far field of said image.

39. An ultrasonic diagnostic imaging system for imaging the harmonic response of structure inside a body which exhibits depth dependent attenuation of ultrasonic energy, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency which is equal to or less than 5 MHz;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals at a harmonic of said fundamental frequency which is equal to or less than 10 MHz; and

means for producing an ultrasonic image from said harmonic echo signals.

40. The ultrasonic diagnostic imaging system of Claim 39, wherein said transmitting means transmits ultrasonic energy into the body at a fundamental frequency which is equal to or less than 2.5 MHz; and

wherein said receiving means receives ultrasonic echo signals at a harmonic of said fundamental frequency which is equal to or less than 5 MHz.

41. The ultrasonic diagnostic imaging system of Claim 39, wherein said transmitting means transmits ultrasonic energy into the body at a fundamental frequency which is less than 2 MHz; and

wherein said receiving means receives ultrasonic echo signals at a harmonic of said fundamental frequency which is less than 4 MHz.

42. The ultrasonic diagnostic imaging system of Claim 39, wherein said receiving means includes a programmable digital filter which is programmed to pass a band of said harmonic echo signals to the exclusion of said fundamental frequency.

43. An ultrasonic diagnostic imaging system for imaging the nonlinear response of tissue, comprising:

a transmitter for transmitting ultrasonic energy into the body at a fundamental frequency;

a receiver, responsive to echoes returned from tissue following said ultrasonic energy transmission, for separating signals representing the nonlinear response of tissue to ultrasound; and

an image processor for producing an ultrasonic image from said nonlinear response signals.

44. The ultrasonic diagnostic imaging system of Claim 43, wherein said receiver includes a filter circuit for separating signals representing the nonlinear response of tissue to ultrasound.

45. The ultrasonic diagnostic imaging system of Claim 43, wherein said receiver includes a signal processor, responsive to the reception of multiple echoes from the same spatial location in tissue, for combining said multiple echo signals to separate signals representing the nonlinear response of tissue to ultrasound.

46. The ultrasonic diagnostic imaging system of

Claim 43, wherein the the nonlinear response of tissue to ultrasound comprises a second or higher order harmonic of said fundamental frequency.

47. The ultrasonic diagnostic imaging system of Claim 43, wherein the the nonlinear response of tissue to ultrasound comprises a subharmonic of said fundamental frequency.